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Begrenzungsbock für vertikale Einphasengeneratoren mit federnd gelagertem Stator

Im Gegensatz zum Drehstromgenerator entsteht bekanntlich beim Einphasengenerator kein Drehfeld, sondern ein stehendes, netzfrequentes Statorfeld. Das Drehmoment setzt sich aus einem Konstantmoment und einem mit doppelter Netzfrequenz pulsierenden Wechselmoment zusammen. Die durch dieses Wechseldrehmoment hervorgerufenen Rüttelkräfte werden über den Stator auf das Fundament übertragen und können in der Folge zur Zerstörung des Stators bzw. des Fundamentes führen.

Aus diesem Grund wählt man vielfach die elastische Aufstellung des Gehäuses, bei der die Übertragung der Rüttelkräfte auf das Fundament durch Federn vermindert wird. Die federnde Aufstellung des Statorgehäuses bei horizontalen Einphasengeneratoren wurde schon des öfteren mit Erfolg praktiziert. Seltener wurden bisher Einphasengeneratoren vertikal aufgestellt, bedingt durch die wesentlich schwierigere federnde Aufstellung des Stators.

Einphasengeneratoren werden vorwiegend für den Bahnbetrieb verwendet. Im Bahnbetrieb treten auf den Fahrleitungen häufig Kurzschlüsse auf, welche in der Folge auch auf den Generator übertragen werden. Die zwischen dem Stator und dem Fundament angeordneten Federn sind den hierbei auftretenden pulsierenden Umfangskräften, die ein Vielfaches derjenigen im normalen Betrieb erreichen, bezüglich Durchfederung und Beanspruchung mechanisch nicht gewachsen, weshalb es notwendig ist, geeignete Maßnahmen dagegen zu treffen.

Zu diesem Zweck ist z. B. bekannt geworden, Anschläge vorzusehen, welche die Durchfederung und Beanspruchung auf ein zulässiges Maß beschränken. Auf die Anschläge können Dämpfungsplatten aus Leder od. dgl. aufgebracht werden, um die metallisch harten Schläge zu dämpfen.

Die Erfindung betrifft einen Begrenzungsbock für vertikale Einphasengeneratoren mit insbesondere durch Federpakete zwischen Stator und Fundament (Schachtring) federnd gelagertem Stator, an dem erfindungsgemäß zur Begrenzung der Auslenkung des Stators, insbesondere bei Auftreten von Kurzschlußkräften Dämpfungselemente, insbesondere Tellerfedern, vorgesehen sind, welche unter Berücksichtigung der Richtungsänderungen der Kurzschlußkraft spiegelbildlich bezüglich der mit den Begrenzungsböcken zusammenarbeitenden, am Statorumfang befindlichen Anschläge angeordnet sind, da die Kurzschlußkraft bekanntlich nach einer Sinuslinie verläuft, d. h., die tangentiale Kurzschlußkraft ihre Richtung ändert.

In Weiterbildung des Erfindungsgedankens können bei Verwendung von Tellerfedern als Dämpfungselemente zur Einstellung des freien Weges zwischen Federpaket und Begrenzungsbock entsprechend der zugelassenen Auslenkung des Federpaketes hinter den Tellerfedern Ausgleichsbleche angebracht sein. Gemäß einem weiteren Erfindungsvorschlag können auf dem Begrenzungsbock und am Statorgehäuse Anschläge zur Begrenzung der radialen Anschläge des Stators angeordnet sein. Weiters können zum Zweck des Ausbaues schadhafter Federpakete Mittel zur Hebung des Stators vorgesehen sein, insbesondere eine hydraulische Hebevorrichtung oder Schrauben, die vorteilhaft in den die spiegelbildlichen Begrenzungsböcke gegeneinander abstützenden Zwischenteilen befindlich sind.

Die Erfindung wird an Hand der beiliegenden schematischen Zeichnung näher erläutert, wobei die Figuren 1, 2 und 3 jeweils Aufriß, Seitenriß und Grundriß der erfindungsgemäßen Anordnung darstellen und Fig. 2 einen Schnitt nach Linie A-A der Fig. 1.

Der Stator 1 ist auf mehreren Federpaketen 2, welche am Umfang gleichmäßig verteilt sind, befestigt. Die Federpakete sind ihrerseits mit dem Schachtring 3 verschraubt. Die Federpakete 2 sind so

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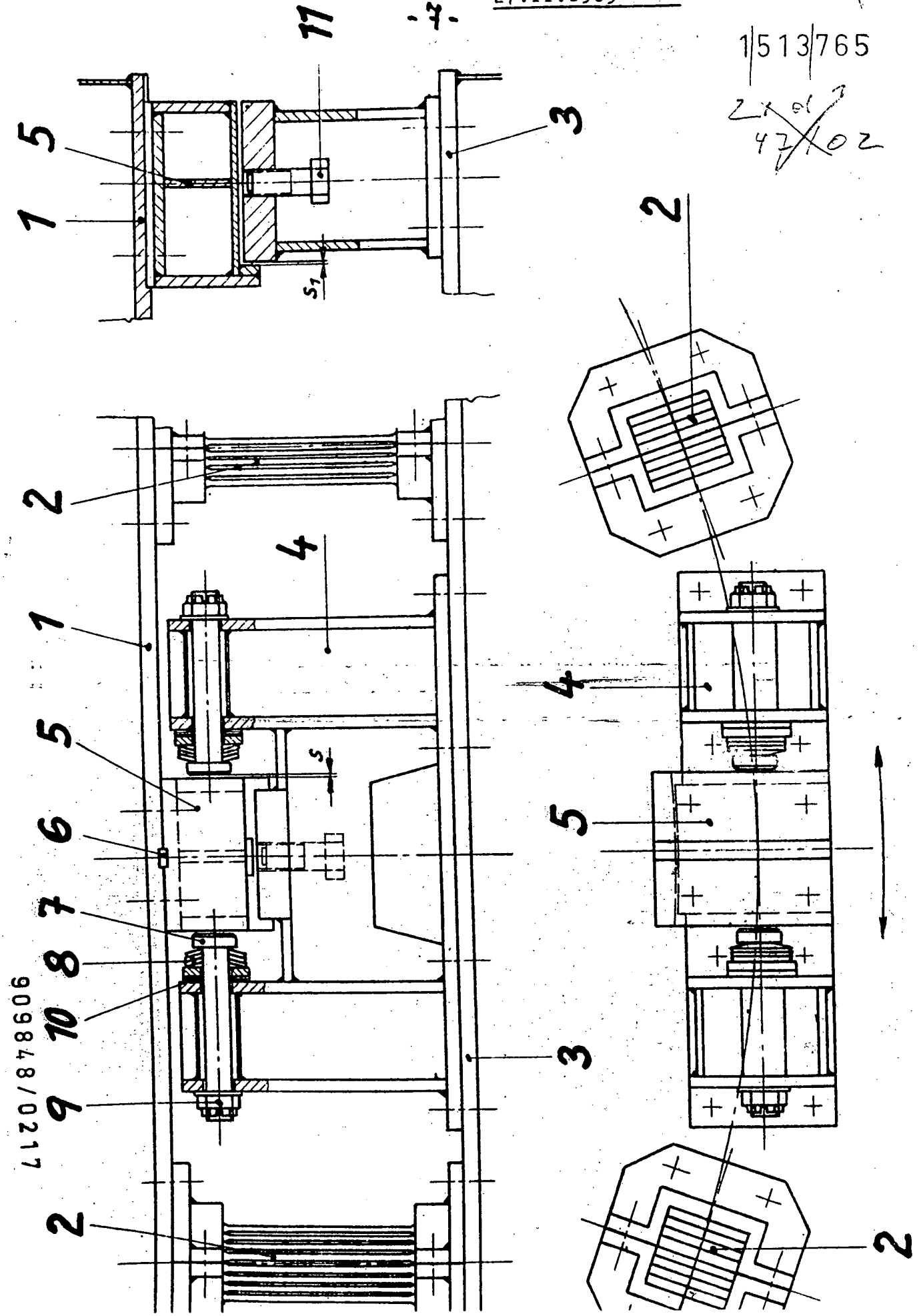

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Begrenzungsbock für vertikale Einphasengeneratoren mit federndgelagertem Stator
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LIMITATION BLOCK [HORSE] FOR VERTICAL SINGLE-PHASE GENERATORS, HAVING ELASTICALLY SUPPORTED STATOR

In contradistinction to the three-phase generator, it is known that in the case of a single-phase generator, no rotary field but a stationary, power-frequency field is generated. The rotary torque or angular momentum consists of a constant torque and an alternating or pulsating torque, pulsating with a doubled power-line frequency. The vibromotive or oscillating forces,

brought about by this pulsating torque are transferred by means of the stator to the foundation, and, subsequently, may lead to the destruction of the stator, respectively of the foundation.

For this reason, the elastic installation of the housing is selected on many occasions, in the case of which installation the transfer of the vibromotive or oscillating forces to the foundation is reduced by means of springs. The elastic mounting of the stator housing in the case of horizontal single-phase generators was already frequently implemented with success in the engineering practice. Contingent upon the more difficult elastic mounting of the stator, single-phase generators were until recently more rarely mounted vertically.

Single-phase generators are mainly used for the railways & rolling-stock operations and maintenance. In railways & rolling-stock operation and maintenance practice, there often occur short circuits on the power-transmission lines, which short circuits are subsequently transferred upon the generator. From a mechanical standpoint, as far as deflection of the spring and stress (loading) is concerned, the springs, arranged between the stator and the foundation, are not equal to or able to cope with the pulsating circumferential forces - occurring on this occasion, and reaching a multiple of [the forces of] these [springs] during standard operation - and, therefore, suitable precautions and measures are to be taken with regard to this [state of affairs].

To this end, it has become known that, e.g., that limit stops are to be provided, which limit the deflection of the spring and the stress to a permissible extent. Damping plates or pads of leather or similar can be mounted upon the limit stops, in order for the metallically hard impacts to be dampened.

The invention pertains to a limitation block or pedestal [horse] for vertical single-phase generators, having a stator, which is in particular supported by means of laminated springs [assembly of springs] between stator and foundation (shaft-top supporting ring), on which stator in accordance with the invention, there are provided cup or disk springs* [*Translator's note: Also known as Belleville springs] for the limitation of the displacement or deflection of the stator, especially when short circuits occur, which cup springs - by taking into account the directional changes of the short-circuit force - are arranged in a mirror-inverted [laterally reversed] manner with respect to the limit stops, interacting with the limitation blocks [horses], and located along the stator circumference, because, as is known, the short-circuit force follows a sinusoid, i.e. the tangential short-circuit force changes its direction.

In a refinement of the inventive concept, shims [compensation elements of sheet metal] can be mounted behind the laminated springs [spring assembly], when cup springs are used as damping elements for the adjustment of the free path between laminated spring and limitation block [horse], corresponding to the deflection of the laminated spring. In accordance with the

invention, limit stops for the limitation of the radial impacts of the stator can be arranged on the limitation block [horse] and on the stator housing. In addition to this, for the purposes of dismantling of damaged or defective laminated springs, there are provided means for the lifting of the stator, especially a hydraulic lifting device of hydraulic screws [Archimedean screws], which are advantageously located in the intermediate parts, supporting in a mirror-inverted manner the limitation blocks [horses] with respect to each other.

The invention is elucidated in greater detail by means of the diagrammatic drawing, attached herewith, wherein Figs 1, 2 and 3 represent front view, side view, and top view, respectively, while Fig. 2 is a section along line A - A of Fig. 1.

The stator 1 is attached on a multiple number of laminated springs 2, which are uniformly distributed along the circumference. On their part, the laminated springs are screwed with the shaft-top supporting ring. The laminated springs 2 are dimensioned in such a way that the stress (loading) of the individual leaf-type springs, brought about by the constant and pulsating torque, does not exceed the permissible value. If the deflection, and, therewith, the stress of the springs, assumes a impermissibly high value, e.g., in the case of short connection, the deflection is limited by means of the limitation blocks [horses] 4. The limitation blocks 4 are rigidly connected to the shaft-top supporting ring 3, and arranged between the laminated

springs 2, respectively. The limit stops 5 are screwed to the stator. The tangential forces, which occur, are transferred by means of the spline* 6. [*Translator's note: Also known as feather key; adjusting spring; parallel key].

If the spring deflection, brought about by the tangential forces assumes an impermissibly high value, the limit stop 5 strikes against the buffer 7 of the limitation blocks [horses] 4. The buffers 7 are designed elastically as a result of the incorporation of the cup springs 8, which are prestressed by means of the nuts 9. By means of the cup springs 8, the first hard impact is transferred in a dampened manner by way of the limitation block 4 to the foundation. The spring deflection of the cup springs 8 is predetermined by the maximal permissible deflection of the spring assemblies 2, while the characteristics of the cup springs 8 should be determined accordingly. Shims 10 are incorporated between cup springs 8 and limitation block [horse] 4, respectively, which provide an opportunity to change the gap s between limit stop 5 and buffer 7 to a small extent, or to compensate installation inaccuracies. By changing the gap s, path of the spring can be adjusted to the desired extent. The limit stop 5 is concurrently designed in such a way that radial forces, which eventually occur, are also transferred from the stator to the limitation block [horse] 4, and, therewith, onto the foundation. As deduced from Fig. 2, a small gap s_1 is located between the limit stop 5 and limitation block [horse] 4, which gap allows a tangential motion of the stator, but when radial

forces occur, the limit stop 5 strikes against the limitation block [horse] 4, and prevents thus a motion of the stator in the radial direction.

As seen in Fig. 2, by raising the screws 11 by rotating them, the stator can be elevated up to the limit stop 5, and, as a result of this, the laminated spring [spring assembly] 2 can easily be replaced if a spring is fractured.

The advantage of the use of damping elements is such that as a result of that, an adjustable resilience or springiness of the tangential impact between stator and foundation (shaft-top support ring) is achieved.

Cup springs [disk springs or Belleville springs] are to be used advantageously because as a result of that, in the case of the smallest space requirement as well as low structural input, the usually large forces, which usually occur, are more easily managed than perchance by helical springs or a hydraulic damping. Another advantage of using cup springs consists in that as a result of different combination and arrangement of these springs, the spring characteristic can be influenced, without a need of undertaking structural changes.

PATENT CLAIMS

1. Limitation block [horse] for vertical single-phase generators, having stator, which is elastically supported

between stator and foundation (shaft-top supporting ring), especially by means of laminated springs [spring assemblies], characterized in that for the limitation of the deflection of the stator, especially when short-circuit forces occur, damping elements, especially cup springs [disk springs or Belleville springs), are provided on the limitation block, which damping elements - while the change of direction of the short circuit force is taken into account - are arranged in a mirror-inverted manner with respect to the limit stops, interacting with the limitation blocks, and located along the stator circumference.

2. Limitation block [horse] as claimed in claim 1, characterized in that when cup springs are used as damping elements, shims are provided behind the cup springs for the purposes of adjusting the free path between laminated spring [spring assembly] and limitation block [horse], corresponding to the permissible deflection of the laminated spring.

3. Limitation block [horse] as claimed in claim 1, characterized in that limit stops for the limitation of the radial impacts of the stator are provided on the limitation block and on the stator housing.

4. Limitation block [horse] as claimed in claim 1 thru 3, characterized in that for the purpose of dismantling defective or damaged laminated springs, there are provided means for the lifting of the stator, in particular a hydraulic lifting device [jack] or a hydraulic screw [Archimedean screw], which are

advantageously arranged in the intermediate parts, supporting the limitation blocks [horses] with respect to one another.

USDoC/USPTO/STIC/Translations Branch
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